

Cyberinfrastructure For Distributed Scientific Modeling

William J. Campbell

Code 935/Applied Information Sciences Branch

NASA/GSFC

Greenbelt, Maryland 20771

Why

Current NASA visualization techniques are visually very appealing and intuitive but lack interactive data manipulation and distributed virtual immersion into the data or models by the end user. This real-time data manipulation and virtual presentation would greatly increase scientific value not only to the sophisticated science user but the general public as well.

Assumptions

We assume buy in from the outset from GSFC management, Headquarters (Appropriate Codes TBD) and most importantly, the target audience being our traditionally user community and new potential customers. We also assume some commitment of current resources and appropriate funding.

Process

If NASA management gives the proposal the green light, then a presentation would be developed explaining technically how these capabilities would work and greatly enable science and potentially build a strong and broader user community. This would be demonstrated to several groups, Headquarters management and appropriate groups from the various interested NASA centers as well as to a yet to be determined outside review group and selected scientists. If excitement and commitment is evident, then to various Headquarter Codes with a funding profile, schedule and other NASA wide user groups.

Technical Discussion (what is it)

What is missing from current visualization capabilities is the ability to interact, in real time with visual scientific data sets. What is being proposed is the development of a desktop, web-based interactive scientific visualization capability. The proposed system would allow background computational processing ongoing within the various NASA computer and mass data storage facilities. This also assumes the development of an online tutorial and a help desk "Ask The Expert". The final product would be in the hands of the end users and within their control to disseminate to their respective communities.

An Example

A NASA sponsored NCAR climate modeler, (Dr. Rosy Reality) is examining a certain weather phenomena in the Colorado Rocky Mountain area. After interrogating several online science databases finds several satellite data sets resident within the various appropriate archives. After verifying her NCCS account was still valid, she proceeded to migrate several 100GB's of data to the

appropriate computation engine for immediate data fusion and further processing. After receiving notification that the processing was complete, she then downloads a compressed subset for additional processing refinements (i.e. subset, rotation, fusion etc.) and visual enhancements.

Dr. Reality interrogates, processes, fuses and displays several different climate datasets such as temperature, pressure, aerosols etc. This interactive visual enhancement could also be shared via the net with other team members geographically dispersed for additional input or datasets. Once Rita and her team are satisfied, the resulting model/datasets is then returned to her archive account for future modifications or additions. This end-to-end process includes data storage, pre-processing, mining, registration, fusion, classification, and multiple methods of presentation including animations of full models or subsets on various computational resources.

Resources & User Requirements

These developments could include computer science research, high speed networking, including wireless computing, and the full spectrum of the various NASA and other facilities. Initially, it would also require several contractor system engineers to determine user requirements, functional requirements, system requirements and a proof of concept rapid prototype demonstration system architecture. This would also include a thorough survey of what is ongoing in the university research and industry communities.

The scientific community and management would test the demonstration system for functionality, usability, enhancements and acceptance. It is also assumed that we would have contact with and/or formal partnerships/grants with selected universities, other NASA organizations and industry.

Marketing & Payoff

We assert that if successful, (functionally and acceptability by the community) the payoff of increased scientific discovery and dissemination to a much larger community than the traditional “read my paper” approach would greatly supercede the investment. Indeed, these capabilities could revolutionize how scientific, medical and other very large complex data sets can be interrogated. It would also be extremely beneficial to many other communities that commercialization success would be significant.

Schedule and Partners

TBD